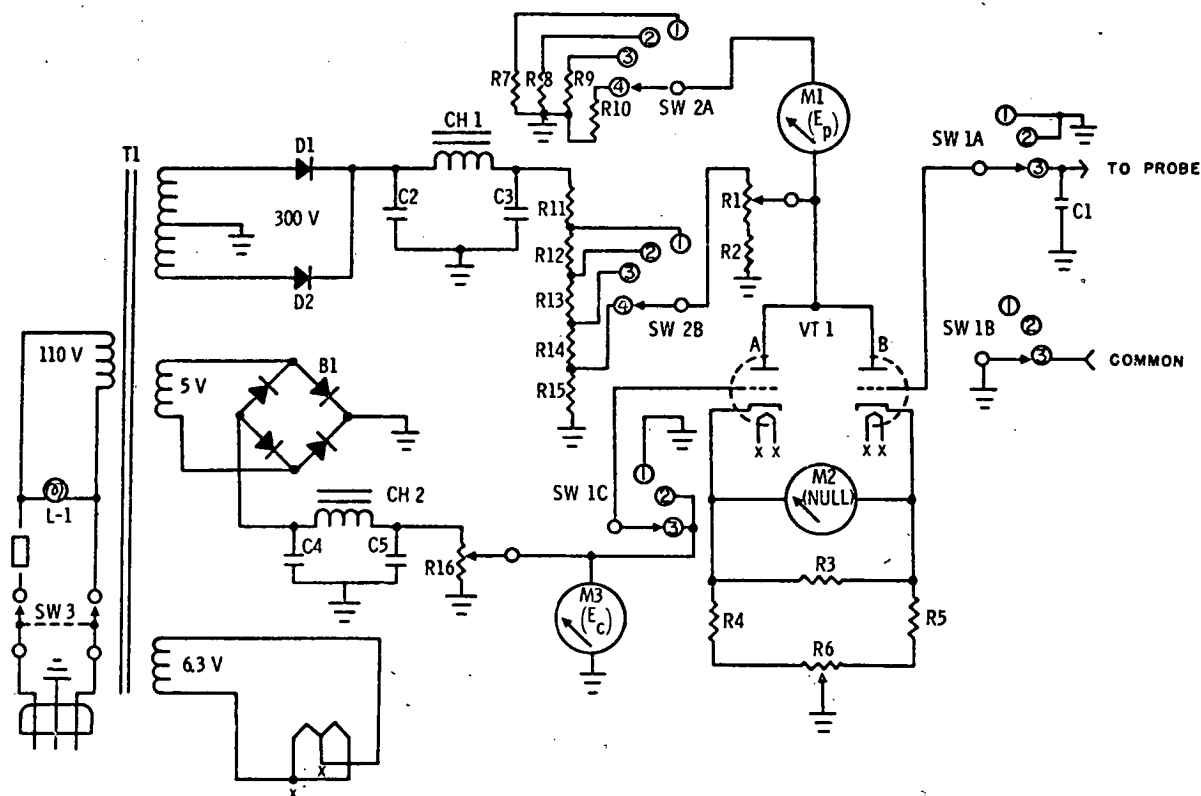


# NASA TECH BRIEF



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# Null Type Instrument for Simplifying Two Dimensional Field Plotting



### The problem:

In developing ionization sources for vacuum gages and other applications it is advantageous to make plots of the electric fields and force lines so that the design may be optimized before a prototype of the device is built. Two dimensional plots are usually sufficient for this work. These are made by drawing the outline of the device on conducting paper (facsimile) with low resistant paint. The dc potentials

which have been scaled down to a few volts in the ratios that are to be used on the device are placed on the painted electrodes.

An efficient and accurate method for determining the field line is needed.

### The solution:

A null type instrument that simplifies two dimensional field plotting.

(continued overleaf)

### **How it's done:**

The instrument is essentially a vacuum tube bridge designed to operate in two modes, tracing and fixed potential. Sensitivity of the instrument in either mode is better than 0.01 volts.

#### **Tracing Mode**

This mode is used to plot equipotential lines. Initial balance is established with function switch SW-1 in position 1 and adjusting R-6 for null reading of M-2.

In operation, SW-1 is placed in position 2 and the desired reference potential is applied on grid A of VT-1 by adjusting R-16 as observed on meter M-3.

Switch position 3 connects the tracing probe to grid B. When the probe is placed at a selected point on the conducting paper, a voltage is registered on grid B. If the probe is moved to a point where M-2 indicates zero, the voltages applied to the two grids are equal. Subsequent movement of the probe on the paper in a direction to maintain zero deflection of M-2 results in a plot of equipotential lines without the necessity of reading absolute values of voltage.

#### **Fixed Potential Mode**

This mode is used to find the potential at any given point on the field plot. With SW-1 in position 3 the

probe is placed on the desired point and R-16 adjusted until meter M-2 is nulled. The voltage corresponding to the voltage impressed on the probe is read on meter M-3.

### **Notes:**

1. This design has reduced plotting time by some 50% and has also improved measurement precision.
2. Requests for further information may be directed to:

Technology Utilization Officer  
Langley Research Center  
Langley Station  
Hampton, Virginia 23365  
Reference: TSP70-10192

### **Patent status:**

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